Amendments To The Claims

Claims 1-17 are presently pending. Please amend Claim 3 as follows and add new Claim 18. This listing and version of claims replaces all prior listings and versions of claims.

1. (original) A variable directivity antenna comprising:

a first antenna group including first and second antennas for receiving a radio wave in a first frequency band, said first and second antennas being disposed in parallel with and spaced from each other by a distance less than a half of a wavelength in said first frequency band, said first and second antennas exhibiting an 8-shaped directivity along a line perpendicular to the length direction thereof; and

phase shifting means for adjusting phases of received signals from said first and second antennas and combining the phase-adjusted signals in such a manner that the resultant signal selectively assumes a first directivity state in which said resultant signal exhibits a directivity in a first direction which is from said first antenna toward said second antenna, and a second directivity state in which said resultant signal exhibits a directivity in a second direction which is from said second antenna toward said first antenna.

2. (original) The variable directivity antenna according to Claim 1 wherein said phase shifting means comprises:

combining means to which the received signals from said first and second antennas are supplied;

a first fixed phase shifter disposed between said combining means and said first antenna; and

variable phase shifting means disposed between said second antenna and said combining means;

said variable phase shifting means, in said first directivity state, coupling the received signal from said second antenna as it is to said combining means, and, in said second

directivity state, coupling a second fixed phase shifter between said second antenna and said combining means;

said first fixed phase shifter providing such an amount of phase shift that, in said first directivity state, signals coming from said second direction received by said first and second antennas are substantially in opposite phase, said second fixed phase shifter providing such an amount of phase shift that, in said second directivity state, a received signal from said second antenna is substantially in opposite phase with an output signal of said first fixed phase shifter.

3. (currently amended) The variable directivity antenna according to Claim 1 ~~or 2~~ wherein received signals from said first and second antennas are supplied to said phase shifting means after being amplified in first and second amplifiers.

4. (original) The variable directivity antenna according to Claim 1 wherein said first and second antennas are formed on a single printed circuit board.

5. (original) The variable directivity antenna according to Claim 1 wherein said first and second antennas are first and second dipole antennas, respectively, having their entire lengths so selected as to receive a radio wave in said first frequency band; extension elements are disposed in line with and outward of opposite ends of each said dipole antennas; the sum of the lengths of said first dipole antenna and said extension elements disposed outward of said first dipole antenna is such as to receive a radio wave in a second frequency band lower than said first frequency band, the sum of the lengths of said second dipole antenna and said extension elements disposed outward of said second dipole being such as to receive a radio wave in said second frequency band; and switch means are connected between said first dipole antenna and said extension elements disposed outward of said first dipole antenna, and between said second dipole antenna and said extension elements disposed outward of said second dipole antenna.

6. (original) A variable directivity antenna comprising:

a first antenna group including first and second antennas for receiving a radio wave in a first frequency band, said first and second antennas being disposed in parallel and spaced by a distance less than a half of a wavelength in said first frequency band, said first and

second antennas exhibiting an 8-shaped directivity along a line perpendicular to the length direction thereof;

a second antenna group including third and fourth antennas for receiving a radio wave in said first frequency band, said third and fourth antennas being disposed in parallel with and spaced by said distance from each other, and exhibiting an 8-shaped directivity along a line perpendicular to the length direction thereof, said third and fourth antennas being disposed perpendicular to said first and second antennas;

first phase shifting means for adjusting phases of received signals from said first and second antennas and combining the phase-adjusted signals in such a manner that the resultant signal selectively assumes a first directivity state in which said resultant signal exhibits a directivity in a first direction which is from said first antenna toward said second antenna, and a second directivity state in which said resultant signal exhibits a directivity in a second direction which is from said second antenna toward said first antenna;

second phase shifting means for adjusting phases of received signals from said third and fourth antennas and combining the phase-adjusted signals in such a manner that the resultant signal selectively assumes a third directivity state in which said resultant signal exhibits a directivity in a third direction which is from said third antenna toward said fourth antenna, and a fourth directivity state in which said resultant signal exhibits a directivity in a fourth direction which is from said fourth antenna toward said third antenna; and

signal combining means for adjusting in value and combining an output signal of said first phase shifting means in said first or second directivity state and an output signal of said second phase shifting means in said third or fourth directivity state, and providing an output signal exhibiting a directivity in a selected one of said first through fourth directions and directions between said first through fourth directions.

7. (original) The variable directivity antenna according to Claim 6 wherein said signal combining means comprises:

first level adjusting means to which an output signal of said first phase shifting means is applied;

second level adjusting means to which an output signal of said second phase shifting means is applied; and

combining means for combining output signals of said first and second level adjusting means;

said first and second level adjusting means selectively assuming a first factor state in which a signal inputted thereto is outputted with a level proportional to a first factor, a second factor state in which a signal inputted thereto is outputted with a level proportional to a second factor smaller than said first factor, and an intercepting state in which an inputted signal is intercepted;

said variable directivity antenna further comprising:

level control signal generating means for providing first and second level control signals to said first and second level adjusting means so as to successively place said first and second level adjusting means in: a first step in which said first level adjusting means assumes the first factor state, and said second level adjusting means assumes the intercepting state; a second state in which said first level adjusting means assumes the first factor state, and said second level adjusting means assumes the second factor state; a third step in which said first and second level adjusting means assume the first factor state; a fourth step in which said first level adjusting means assumes the second factor state, and said second level adjusting means assumes the first factor state; a fifth step in which the first level adjusting means is in the intercepting state, and said second level adjusting means assumes the first factor state; a sixth step in which said first level adjusting means assumes the second factor state, and said second level adjusting means assumes the first factor state; a seventh step in which said first and second level adjusting means assume the first factor state; and an eighth step in which said first level adjusting means assumes the first factor state, and said second level adjusting means assumes the second factor state.

8. (original) The variable directivity antenna according to Claim 7, further comprising directivity control signal generating means providing said first and second antenna groups with directivity control signals, which, in said first through fourth steps, places the directivities of said first and second antenna groups selectively in a state in which the directivity

of said first antenna group is in said first directivity state and the directivity of said second antenna group is in said third directivity state, and a state in which the directivity of said first antenna group is in the second directivity state and the directivity of said second antenna group is in the fourth directivity state, and which, in said fifth through eighth steps, places the directivities of said first and second antenna groups selectively in a state in which the directivity of said first antenna group is in said second directivity state and the directivity of said second antenna group is in said third directivity state, and a state in which the directivity of said first antenna group is in the first directivity state and the directivity of said second antenna group is in the fourth directivity state.

9. (original) The variable directivity antenna according to Claim 6 wherein said first through fourth antennas are first through fourth dipole antennas having their entire lengths so selected as to receive a radio wave in the first frequency band; extension elements are disposed in line with and outward of opposite ends of each said dipole antennas; the sum of the lengths of each of said first through fourth dipole antennas and said extension elements disposed outward of that dipole antenna is such as to receive a radio wave in a second frequency band lower than said first frequency band; and switch means are connected between said first dipole antenna and said extension elements disposed outward of said first dipole antenna, between said second dipole antenna and said extension elements disposed outward of said second dipole antenna, between said third dipole antenna and said extension elements disposed outward of said third dipole antenna, and between said fourth dipole antenna and said extension elements disposed outward of said fourth dipole antenna;

said variable directivity antenna further comprising switching control means, which opens said switch means when a radio wave in the first frequency band is to be received, and closes said switch means when a radio wave in the second frequency band is to be received.

10. (original) The variable directivity antenna according to Claim 9 further comprising:

variable filter means comprising a first variable filter to which a received signal from said first antenna group is applied and which has a passband changed to a selected one of the first and second frequency bands in accordance with a first passband varying signal, and a

second variable filter to which a received signal from said second antenna group is applied and which has a passband changed in accordance with a second passband varying signal; and

passband varying signal generating means for providing said first and second filter means with said first and second passband varying signals.

11. (original) The variable directivity antenna system according to Claim 10 wherein, when said level control signal generating means and said directivity control signal generating means are generating such first and second level control signals and directivity control signals as to provide said antenna system with a directivity to receive a desired radio wave, said passband varying signal generating means provides said first and second variable filters with such first and second passband varying signals as to make said first and second variable filters pass said desired radio wave.

12. (original) The variable directivity antenna system according to Claim 11 further comprising a receiving apparatus to which a received signal is coupled from said antenna system through a transmission line, said receiving apparatus transmitting antenna control data corresponding to a channel in which a signal to be received is being transmitted through said transmission line.

13. (original) The variable directivity antenna system according to Claim 12 wherein said receiving apparatus has memory means for storing therein said antenna control data and data relating to said channel in correlation with each other, the first and second level control signals, the directivity control signals, and the first and second passband varying signals corresponding to the desired channel are generated in accordance with said antenna control data; and

in a state when said receiving apparatus is receiving said desired channel, said antenna control data for the desired channel is read out of said memory means, and transmitted through said transmission line to said level control signal generating means, said directivity control signal generating means, and said passband varying signal generating means.

14. (original) The variable directivity antenna system according to Claim 13 wherein:

after said receiving apparatus is set to be able to receive said desired channel, and while said first and second passband varying signals are being supplied to said first and second variable filters so as to make said first and second variable filters pass said desired channel therethrough, said first and second level control signals and said directivity control signals are varied, while monitoring a signal receiving condition at said receiving apparatus, to determine the first and second level control signals and directivity control signals which provide an allowable receiving condition; and

data relating to the thus determined first and second level control signals and directivity control signals, and data relating to the first and second passband varying signals supplied to said passband varying signal generating means when an allowable receiving condition has been attained, are stored as said antenna control data in said memory means.

15. (original) The variable directivity antenna system according to Claim 13 wherein:

when a state in which said desired channel signal is received at said receiving apparatus becomes intolerable, while the first and second passband varying signals are being applied to said first and second variable filters so as to make said first and second variable filters pass said desired channel signal therethrough, the first and second level control signals and said directivity control signals are successively changed, with the signal receiving condition at said receiving apparatus being monitored, to determine said first and second level control signals and directivity control signals which provide an allowable signal receiving condition; and

said first and second level control signals and directivity control signals providing said allowable signal receiving condition are substituted for the previous data relating to said first and second level control signals and directivity control signals in said antenna control data.

16. (original) The variable directivity antenna system according to Claim 6 wherein received signals from said first through fourth antennas are amplified by respective associated amplifying means.

17. (original) The variable directivity antenna system according to Claim 6 wherein said first and second antennas are formed on a first printed circuit board, and said third and fourth antennas are formed on a second printed circuit board.

18. (new) The variable directivity antenna according to Claim 2 wherein received signals from said first and second antennas are supplied to said phase shifting means after being amplified in first and second amplifiers.